CLAIMS

Therefore, having thus described the invention, at least the following is claimed:

1. A system to derive symbol timing for a receiver, comprising:

a slicer that decodes a received signal segment into a discrete data symbol;

a calculator that receives the received signal segment and the discrete data symbol, that derives a timing phase error based upon the received signal segment and discrete data symbol, and computes an average based upon said timing phase error;

a circuit that receives the average and that develops a control signal based upon the average; and

an oscillator that receives the control signal and that generates symbol timing for a receiver.

2. The system of claim 1, wherein the calculator comprises a multiplier and a leaky integrator.

3. The system of claim 1, wherein the slicer employs an advanced data recovery technique for decoding the received signal segment.

4. The system of claim 1, wherein the circuit comprises a phase locked loop.

5. The system of claim 1, wherein the oscillator is a voltage controlled oscillator.

6. The system of claim 1, wherein the oscillator is configured to generate symbol timing for a transmitter.

7. The system of claim 1, wherein the system is part of a point-to-point system.

8. The system of claim 7, wherein the system is part of a full duplex system.

9. The system of claim 7, wherein the system is part of a half duplex system.

10. The system of claim 1, wherein the system is part of a multi-point system.

11. The system of claim 10, wherein the multi-point system operates on discrete multi-tone protocol.

12. The system of claim 10, wherein the multi-point system operates on carrier amplitude modulation protocol.

13. The system of claim 10, wherein the multi-point system operates on multiple virtual lines protocol.

14. The system of claim 13, further comprising a fractionally spaced forward equalizer producing a plurality of coefficients.

15. The system of claim 14, further comprising a centroid error calculation for the plurality of coefficients received from the fractionally spaced forward equalizer.

16. The system of claim 15, wherein the calculator is configured to subtract the centroid error calculation from the average.

17. The system of claim 13, further comprising a dual eye close structure, the first eye close being coupled to the received signal segment and the second eye close being coupled to an output of a decision feedback equalizer, wherein said first and second eye closes control a switch to remove the signal path from the calculator to the circuit.

18. A system to track symbol timing for a receiver, comprising:

a forward equalizer for receiving a signal segment and for producing an equalized signal based upon a plurality of coefficients applied to the received signal segment;

a centroid error calculator for receiving a plurality of coefficients from the forward equalizer and for calculating a centroid error from the plurality of coefficients and a nominal number based upon the plurality of coefficients;

a first subtractor for receiving the equalized signal from the forward equalizer and a noise correction calculated by a decision feedback equalizer, and for calculating a first difference based upon the equalized signal and the noise correction;

a first phase rotator for receiving the first difference from the first subtractor and an inverted result of a phase corrector, and for producing a square signal based upon the first difference and the inverted result;

a slicer or receiving the square signal from the first phase rotator, that decodes the square signal into a discrete data symbol;

a first multiplier for receiving the first difference and the discrete data symbol, and for deriving a timing phase error therefrom;

a leaky integrator for receiving the timing phase error and the centroid error calculation and for producing an average timing phase error based upon the timing phase error and the centroid error calculation;

a switch for receiving the average timing phase error and an eye close signal from a first and second eye close function, which opens a connection to a phase

locked loop when the eye close signal is asserted, the eye close signal being asserted by the first or second eye close functions when no received signal segment is sensed;

a phase locked loop for receiving the average timing phase error when the switch is closed and producing a control voltage; and

a voltage controlled oscillator for receiving the control voltage from the phase locked loop and generating symbol timing for a receiver.

19. A system to track symbol timing for a receiver, comprising:

means for decoding a received signal segment into a discrete data symbol;

means for calculating a timing phase error, based upon the received signal segment and discrete data symbol, and an average timing phase error;

means for creating a control signal based upon the average timing phase error; and

means for receiving the control signal and generating symbol timing for a receiver.

20. The system of claim 19, wherein the system further comprises:

means for equalizing the received signal;

means for computing a centroid error based upon coefficients of the equalizing means;

means for subtracting the centroid error from the average timing phase error; and

means for opening the circuit between said calculating means and said means for creating the control signal.

21. A method for deriving symbol timing, comprising the steps of:

decoding a received signal segment into an discrete data symbol;

calculating a timing phase error and an average timing phase error based upon the received signal segment and discrete data symbol;

creating a control signal based upon the average timing phase error; and

generating symbol timing for a receiver based upon the control signal.

22. The method of claim 21, further comprising the step of generating symbol timing for a transmitter based upon the control signal.

23. The method of claim 21, further comprising the steps of:

equalizing the received signal with a forward equalizer;

calculating the centroid of the coefficients of the forward equalizer; and

subtracting the centroid of the coefficients of the forward equalizer from the average.

24. The method of claim 21, further comprising the steps of:

using a first eye close test on the received signal;

cleaning noise from the received signal with a decision feedback equalizer;

using a phase corrector to put a constellation in a correct orientation;

using a second eye close test on the constellation; and

opening a flywheel switch when an output of the first or second eye close is asserted.

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